Introduction to the PICAXE Microcontroller

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Introduction to the PICAXE Microcontroller

KEY TO THIS PROGRAM

If you like this program:
Fall asleep with your head forward

If you dislike this program:
Fall asleep with your head backward.

All the heads should be forward
when I am finished :-)

Introduction to the PICAXE Microcontroller

PROGRAM OUTLINE

I. History of the PICAXE
II. PICAXE Processor Line
III. PICAXE Commands
IV. PICAXE Programming
V. PICAXE Sample Program
VI. PICAXE Resources

Introduction to the PICAXE Microcontroller

I. History of the PICAXE

- Based upon the Microchip PIC Series of Microcontrollers.
- PICAXE is a pre-loaded “Basic Interpreter” or “bootstrap firmware code”.

Introduction to the PICAXE Microcontroller

I. History of the PICAXE

- Produced by a UK (British) company called Revolution Education Ltd. (Rev-Ed)
- The first PICAXE interpreter was produced in 1999 but has been vastly improved and expanded since that time.

Introduction to the PICAXE Microcontroller

II. PICAXE Processor Line

- Currently there is a wide selection of processors available in the PICAXE line.
- Available in 8 Pin to 40 Pin DIP packages.
- Available also in Surface Mount: (SOIC, and TQFP Packages).

Introduction to the PICAXE Microcontroller

II. PICAXE Processor Line

PICAXE M2 SERIES
Standard Series of Controllers

Processor	Program Memory	I/O Pins	RAM	Clock
PICAXE 08M2	2048 Bytes (2K)	6	128 Bytes	4-32 MHz
PICAXE 14M2	2048 Bytes (2K)	12	512 Bytes	4-32 MHz
PICAXE 18M2	2049 Bytes (2K)	16	256 Bytes	4-32 MHz
PICAXE 20M2	2048 Bytes (2K)	18	512 Bytes	4-32 MHz

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II. PICAXE Processor Line

PICAXE X2 SERIES

Advance Series of Controllers

More Features, Ports, and Speed

Processor	Program Memory	I/O Pins	RAM	Clock
PICAXE 20X2	4096 Bytes (4K)	18	256	4-64 MHz
PICAXE 28X2	4096 Bytes (4K)	22	1280	4-64 MHz
PICAXE 40X2	4096 Bytes (4K)	33	1280	4-64 MHz

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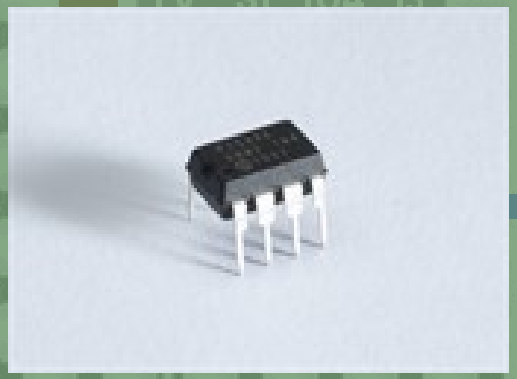
II. PICAXE Processor Line

PICAXE 08M2



PICAXE 14M2

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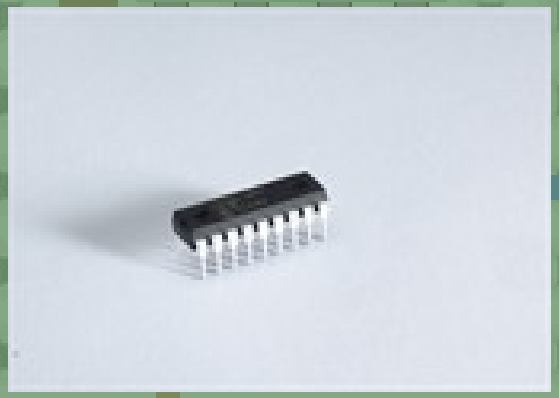
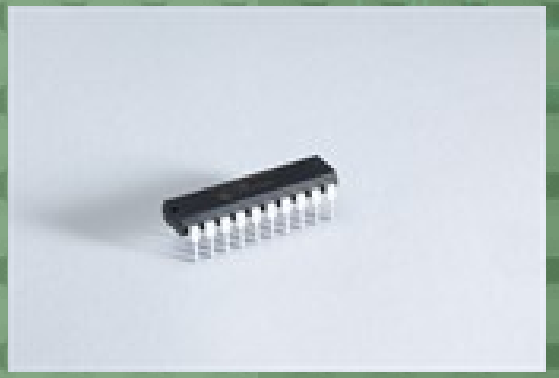
II. PICAXE Processor Line

PICAXE 18M2



PICAXE 20M2



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II. PICAXE Processor Line

PICAXE 20X2

PICAXE 28X2

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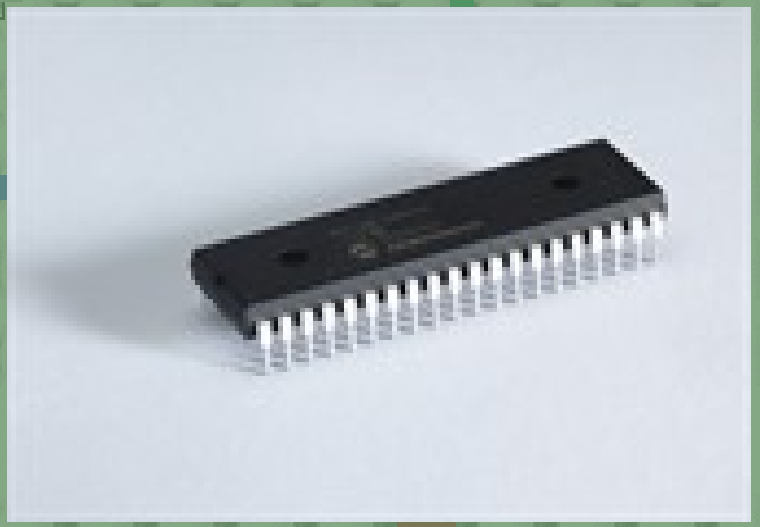
II. PICAXE Processor Line

PICAXE 40X2 – TOP OF THE LINE

600 mm DIP Package – All others 300mm DIP Package



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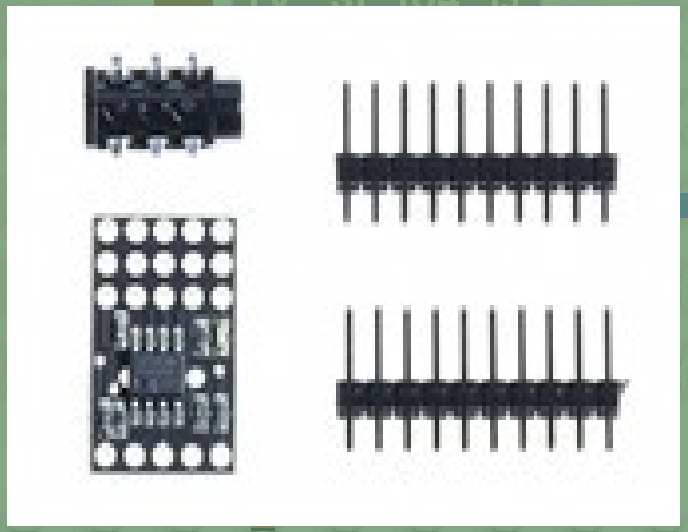
II. PICAXE Processor Line

PICAXE 08M2 MODULE



PICAXE 28X2 MODULE

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III. PICAXE Commands

- Originally, microcontrollers were programmed in assembler
-
- More recently, nearly all microcontroller programming is done in C++
-
- The PICAXE is programmed in BASIC!!

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III. PICAXE Commands

Digital Input/Output Commands

COMMAND	DETAILS	COMMAND	DETAILS
High	Switch an output pin on	Pwmout	Generate a continuous pulse width modulation
Low	Switch an output pin off	Pwmduty	Set duty cycle of a pulse width modulation output
Toggle	Switch an output between on and off	Input	Set a pin as in input
Sound	Generate simple sounds	Output	Set a pin as an output
Button	Detect and debounce a pushbutton switch	If Pin	Respond to the state of an input pin

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III. PICAXE Commands

Time Delays and Variables

COMMAND	DETAILS	COMMAND	DETAILS
Pause	Pause for a defined number of milliseconds	For/Next	Repeat a loop for number of time. Return from loop
Pauseus	Pause for a defined number of mcroseconds	If / Else	Conditionally execute program code. Alternative
Wait	Delay for a number of seconds	EndIf	End of If / Else statement
Sleep	Sleep for a period of time	Gosub / Return	Call a routine Come back from routine
Doze	Reduce pwr consumed for a short period of time	Goto	Continue program execution from label

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IV. PICAXE Programming

- PICAXE is programmed with a serial connection
- Programming Pins: SERIN, SEROUT, GND.
- Programming can be done with a Windows Based PC with a RS232 Serial or USB Port.

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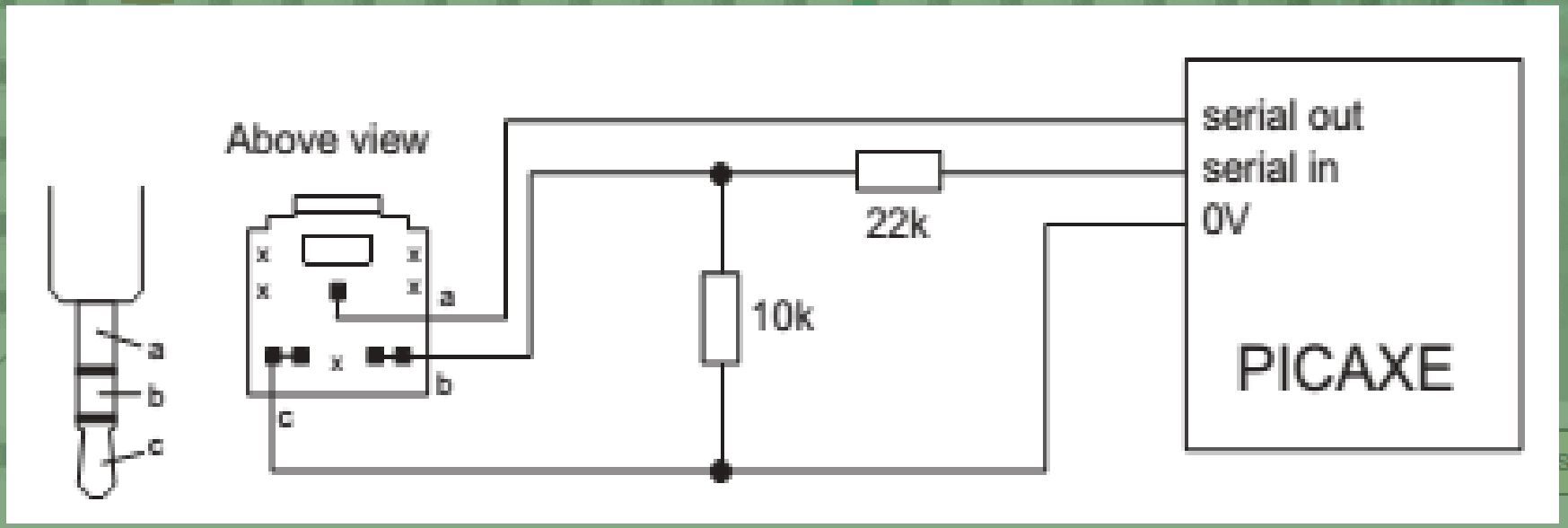
IV. PICAXE Programming

Serial Port Programming

Can use a DB-9 Male in Place of 3.5 mm Connector



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IV. PICAXE Programming

USB Port Programming

Uses a USB to Serial Adapter.

USB Serial Cable
#AXE027

USB Serial Adapter
#AXE029

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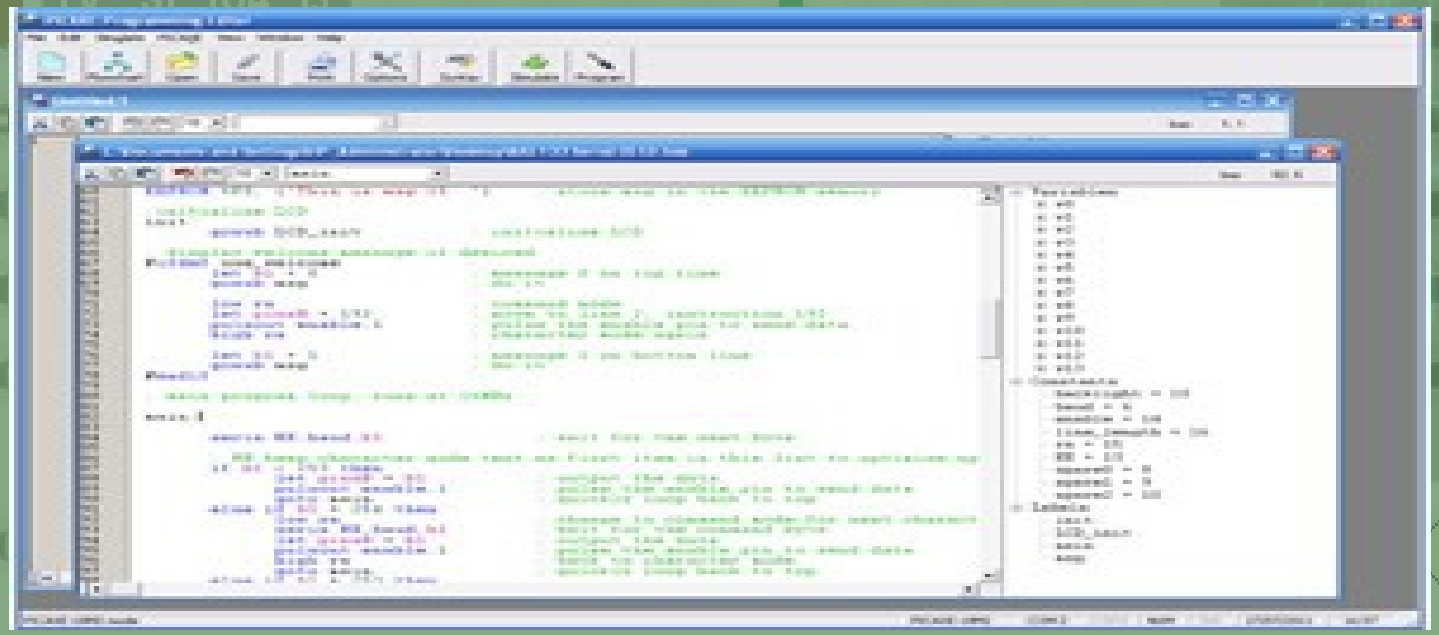
IV. PICAXE Programming

Programming Software:
PICAXE Programming Editor – Version 5



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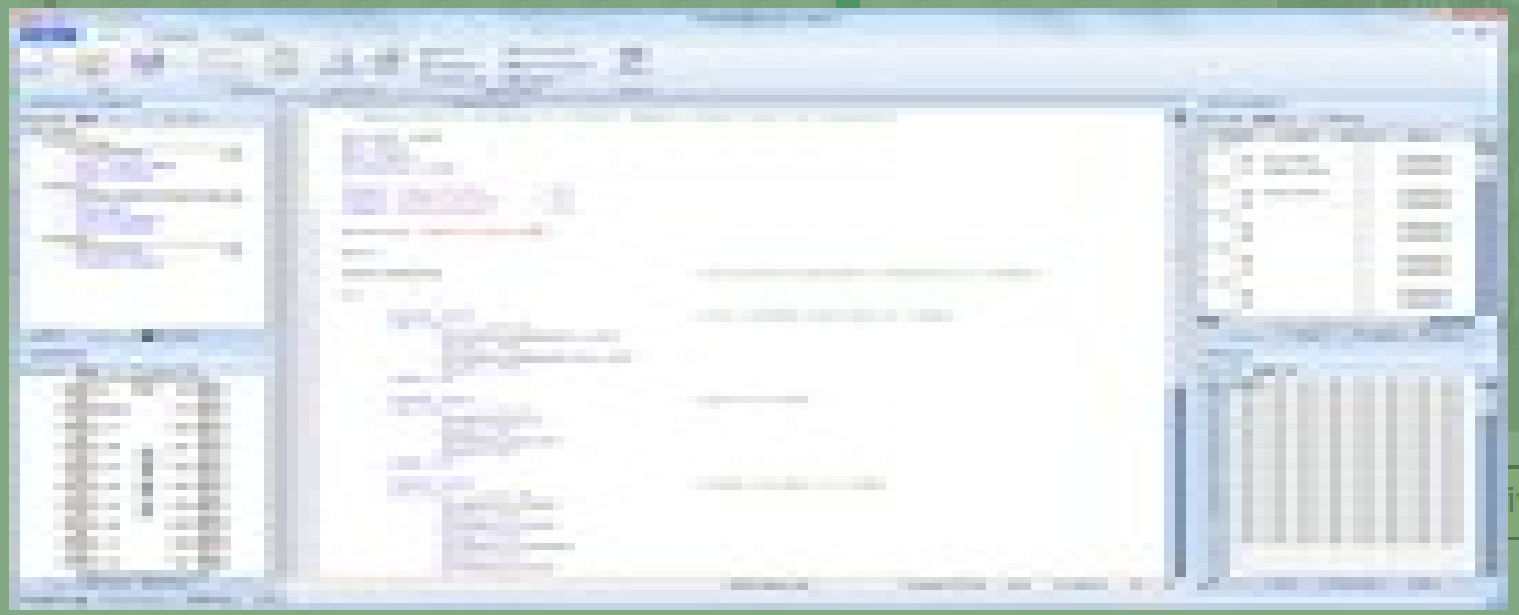
IV. PICAXE Programming

Programming Software:
PICAXE Editor 6
(Replaces PICAXE Programming Editor V5)



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IV. PICAXE Programming

Programming Software:
AXEPAD: Available in Windows, Linux, and Mac

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IV. PICAXE Programming

Items needed to start with PICAXE Programming and Experimenting:

- **Computer with Windows, Linux, or Mac OS.**
  More programming applications available with Windows.
- **Serial Cable or USB to Serial Converter:**
  If computer has USB Ports only or if desired Port.

Introduction to the PICAXE Microcontroller

IV. PICAXE Programming

Items needed to start with PICAXE Programming and Experimenting:

- **3VDC TO 5VDC Power Supply or Battery. <u>DO NOT EXCEED 5VDC.</u>**
- **PICAXE Controller of choice.**
- **Solderless Breadboard with parts needed to breadboard desired circuit..**

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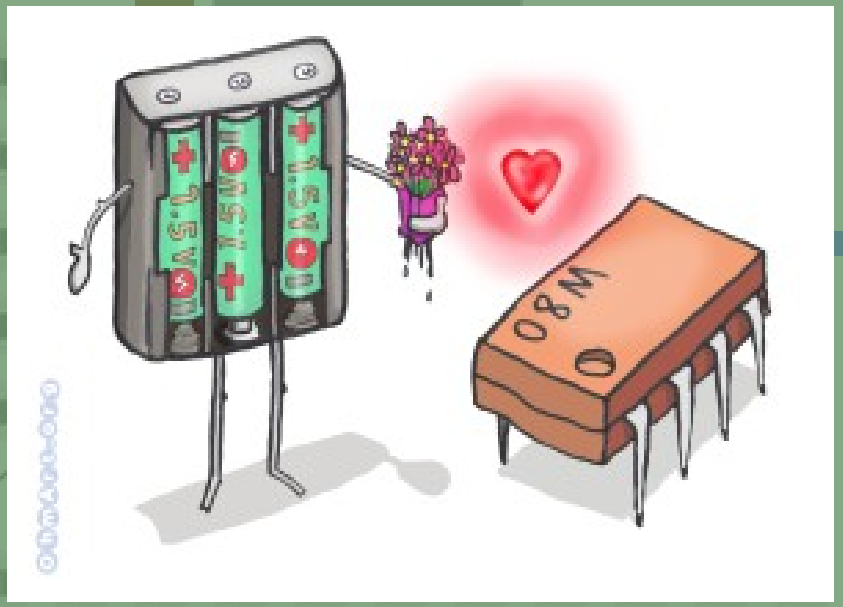
IV. PICAXE Programming

Do not apply more than 5VDC to your PICAXE!!



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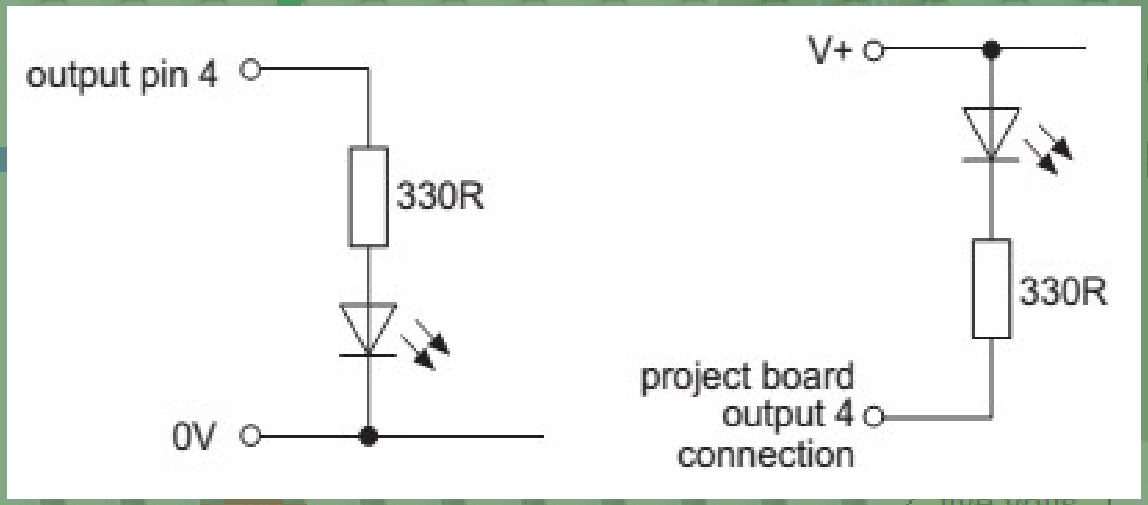
V. PICAXE Sample Program

Quick Program: BLINKNG LED

Turns Port 4 (PIN 3) On and off in a continuous loop.

```
main:     high 4
          pause 1000
          low 4
          pause 1000
          goto main
```



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VI. Sample PICAXE Project

DEMONSTRATION TIME:

- A 3 minute or 10 minute timer with a PICAXE 08M2 Processor with less parts count than a comparable 555 Timer.
- The 555 Timer cannot do 2 time modes without a higher parts count.

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VI. PICAXE Resources

BOOK RESOURCES:

- Ham Radio for Arduino and PICAXE
  by Leigh L. Klotz Jr. WA5ZNU
  ISBN-13: 978-0872593244

- Programming and Customizing the PICAXE Microcontrollers by David Lincoln
  ISBN-13: 978-0071457651

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VI. PICAXE Resources

INTERNET RESOURCES:

- PICAXE Website: http://www.picaxe.com
- PICAXE Programming Software: http://www.picaxe.com/Software
- PICAXE Hardware Manuals: http://www.picaxe.com/Getting-Started/PICAXE-Manuals/

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VI. PICAXE Resources

INTERNET RESOURCES:

- PICAXE Wikipedia Page: http://en.wikipedia.org/wiki/PICAXE
- YouTube Video Tutorials:

https://www.youtube.com/user/azadude18/videos

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